

Centrality dependence of J/ψ production in Au+Au and Cu+Cu collisions by the PHENIX Experiment at RHIC

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Experimental studies at the Relativistic Heavy Ion Collider (RHIC) have been performed to find and study a plasma state of deconfined quarks and gluons, called the quark-gluon-plasma (QGP).

The J/ψ has long been considered as one of the most promising probes to study the formation of the QGP, since the J/ψ yield was expected to be suppressed due to color Debye screening in the QGP.

Recent numerical lattice QCD calculations however indicate that the J/ψ will survive as a bound state at RHIC energies, while χ_c and ψ' will be dissolved around the critical temperature T_C . Since about 40% of J/ψ come from the feed down of χ_c and ψ' , this will result in a reduction of the J/ψ yield even if the direct J/ψ 's are not suppressed themselves.

Several models predict that the J/ψ yield will be a balance between destruction due to gluon rescattering and enhancement due to the recombination of uncorrelated $c\bar{c}$ pairs, which are produced abundantly in the initial collisions at RHIC energy.

To understand the J/ψ production in hot and dense matter and differentiate between these competing effects, it is important to do systematic studies of J/ψ production with several system sizes and collision energies.

PHENIX has measured the J/ψ yield in Au+Au and Cu+Cu collisions at $\sqrt{s_{NN}} = 200$ GeV at both mid-rapidity and forward-rapidity. The latest results of the centrality dependence of the nuclear modification factor R_{AA} for the J/ψ in Au+Au and Cu+Cu collisions will be shown and compared to the theoretical models to extract the in-medium effects on the J/ψ production.